American Dynamics

A Tyco International Company

# MegaPower 3200

# Extended Dome/PTZ

# Camera Protocol

User Guide

8200-0421-23 A

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# MegaPower 3200 Extended Dome/PTZ Camera Protocol

***User Guide***

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## About this Guide

This user guide explains the installation, configuration, and operation of the extended camera communications protocols used in the MegaPower 3200 video-matrix closed-circuit television (CCTV) system with Release 2.2 or later.

Other related documents are:

- *MPCPU Installation and Service Guide* (8200-0421-01)
- *MPCPU Operator's Guide* (8200-0421-02)
- *MPCPU Administrator's Guide* (8200-0421-03)
- *Matrix Switcher Install Guide* (8200-0421-08)
- *MegaPower CPU Ethernet Firmware Upgrade* (8200-0813-01).

### Protocols in this Guide

The following communications protocols are discussed in this guide, and detailed information for each protocol is found in the referenced appendixes:

- BBV Star Card (Appendix A on page 7)
- Bosch Autodome (Appendix B on page 11)
- Pelco-D (Appendix C on page 15)
- Pelco-P (Appendix D on page 19).

Only the released XML files are supported. Changes to the XML files could render the camera handler inoperable. Only the third-party dome models listed in the appendixes are known to operate with these protocols.

## Installing the Camera Protocol Handler Files

1. In your browser, go to the American Dynamics website (http://*americandynamics.net*) and download the desired BBV Star Card, Bosch Autodome, Pelco-D, and Pelco-D XML configuration files to a folder of your choice on your computer.
2. Ensure that each XML file ends with the extension 'XML'.


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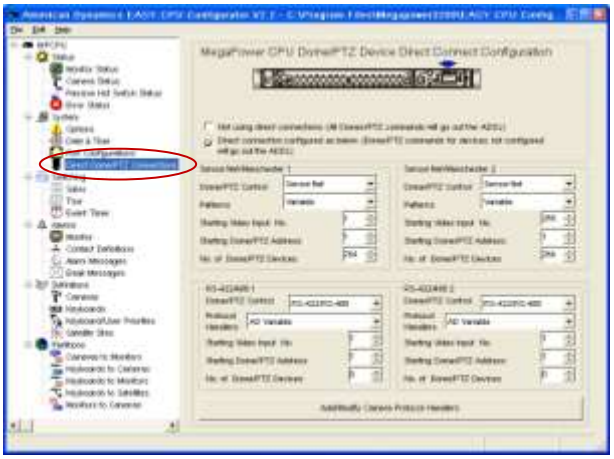
# Selecting Camera Protocol Handlers

To select camera control handlers, do the following:

1. From the EASY CPU Main Screen, click on **Direct Dome/PTZ Connections** in the left-hand Explore Menu.

**Figure 1. EASY CPU Direct Dome/PTZ Connections screen**



2. Check the box labeled **Direct connection configured as below (Dome/PTZ commands for devices not configured will go out the ADDL)**. The configuration fields are displayed as shown in Figure 1.

# Adding Camera Protocol Handlers

**Note:** Steps 1 through 5 of the following procedure only need to be done if the camera protocol handlers you want to use are not yet installed.

To add camera control handlers, do the following:

1. Click **Add/Modify Camera Protocol Handlers** at the bottom of the screen. The Protocol Handler Form screen appears.

**Figure 2. Protocol Handler Form screen**

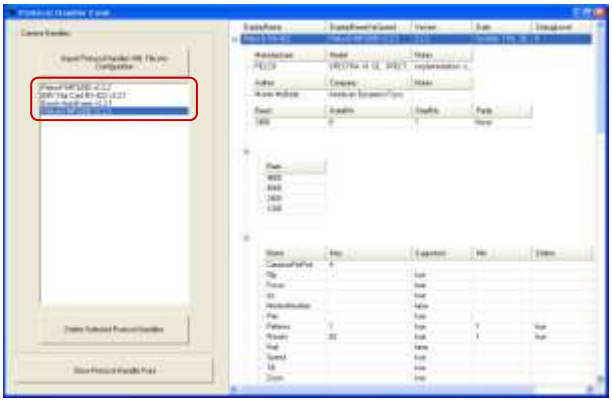
2. Click **Import Protocol Handler XML File into Configuration**.

3. In the file handler screen, navigate to the folder containing the XML protocol configuration files you downloaded, and then highlight all the files that you want to import into the current EASY CPU configuration.

   **Note:** The current configuration can be a "New" configuration (the default when you first start EASY CPU), or a configuration previously read from an MPCPU, or opened from a previously saved configuration file. Once imported, the Protocol Handler becomes part of the configuration. Like any other configuration setting, the configuration must be written to an MPCPU or saved to a configuration file to be preserved. For example, if you import Protocol Handlers and save the configuration to a file, those Protocol Handlers will be present when the configuration file is subsequently opened.

4. Click **Open** and the selected files appear in left-hand column, Camera Handlers, of the Protocol Handler Form screen (Figure 3). The right side of the screen displays the protocol parameters of the highlighted protocol. These parameters are for information only and cannot be changed here.

Figure 3. Populated Protocol Handler Form



5. When you have added all the XML protocol configuration files that you want, click **Close Protocol Handler Form**. The Direct Dome/PTZ Connections screen reappears.

   **Note:** To delete a listed file, highlight the appropriate file, and click **Delete Selected Protocol Handlers**. This action only removes the file from the list and the MPCPU configuration data file; it does not delete the XML file from the PC disk drive.

## Configuring Camera Protocol Handlers

To configure the camera control handlers, do the following:

1. In the RS-422/485 1 section and/or RS-422/485 2 section, choose **RS-422/RS-485** or **RS-232**, depending on the camera physical connections type, from the dropdown menu in the Dome/PTZ Control field.

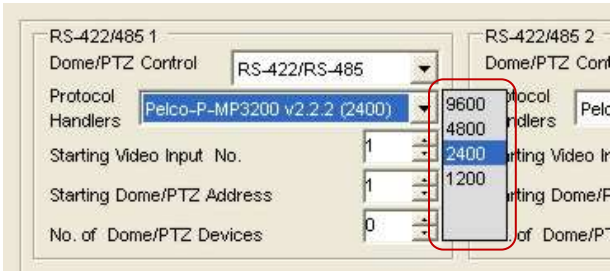
   **Note:** The 1 and 2 at the end of a section name indicates port 1 and port 2 respectively.

2. In the RS-422/485 1 (and 2) sections, click the Protocol Handlers field, and a dropdown menu appears.

Figure 4. RS-422/485 dropdown menu choices

3. Highlight the appropriate protocol handler for the cameras that you want to use. Another dropdown menu appears that allows you to choose the data rate.

Figure 5. Protocol handler baud rate dropdown




4. Click on the appropriate baud rate, and the baud rate changes in the Protocol Handlers field. The baud rates available for a protocol handler are displayed for selection when the mouse cursor is positioned over the Protocol Handler field.

   **Note:** If the same protocol handler file is used for both sections 1 and 2, they must be set to the same data rate. A second data rate can be obtained by copying, renaming, and installing the file.

5. Choose the appropriate values for the other fields in each section:

   - Starting Video Input No.
   - Starting Dome/PTZ Address
   - No. of Dome/PTZ Devices

6. Save your new configuration before continuing.

## Installing and Operating

For specific installation and operation information on extended dome/PTZ protocols for the MP3200 system, refer to the respective camera protocol appendix.

The extended dome/PTZ camera protocols use only one-way (simplex) communications to the dome/PTZ camera; therefore data return lines are not required. However, only American Dynamics dome/PTZ camera devices connected with American Dynamics RS-422/-485 control with return data or SensorNet can provide the following features:

- Camera Status screen information in these columns:
  - Dome/PTZ On-Line
  - Mnemonic

  - Flash Version No.
  - Device Serial Number
  - Device Date Of Manufacture
- Ping test
- Device firmware upgrade

For configuration wiring block diagrams, refer to Appendix E: Block Diagrams on page 23.

## Debugging Support

The following comments are suggested to assist you in the event you need to debug the EASY CPU extended camera protocol handlers.

- In the Camera Status screen, the Dome/PTZ On-Line column is unable to show the status because the extended protocols are simplex data routed one-way to the dome/PTZ device.
- Additionally, the Ping test that is normally used to test domes is not operational for the same reason (simplex data one-way).
- You should verify the correct data rate setting in the Direct Dome/PTZ Connections screen as compared to the dome strapping or set-up. Also, you should verify the dome/PTZ address strapping or set-up is correct.
- Verify the correct protocol handler is selected. The information contained in the Protocol Handler Form may be useful in verifying that the correct handler is being used.
- The distribution panel LED indicators display Power-On/Heartbeat status, Host data detect, and Channel 1-16 data detect. Use the distribution panel line status test switch to verify connections and operation.
- When you read in an XML file, EASY CPU checks to ensure the basic, required protocol handler sections are present. If any of these sections are not present, error messages are displayed. If the parameter values have been improperly set or omitted, this error condition will not be detected until an attempt is made to control a camera and it does not work correctly.

## Overview of Camera Control Definition Files

The camera control definition file is a text or XML file with the information formatted as an XML document. It tells the generic camera control handler in the MP3200 system how to communicate with a particular type of camera controller.

You can create this file in any available text editor. The easiest way to create a handler file is to copy an existing file and edit it to meet your needs.

Before you begin you will need to know:

- What camera control functions are supported by the camera
- What byte streams need to be sent to the camera for each function
- How to specify the list of supported functions, and their associated byte streams in the definition file for the generic handler.

**Notes:** Remember the following points while working in XML:

- Tag and attribute names are case sensitive.
- If you misspell a tag or attribute name, it is typically ignored and assumed to be something new. Only known tags and attributes are noticed.
- If the open and close tags are not identical, a syntax error will occur.
- Normally, white space (blank characters) prior to and following any value is ignored. However, this implementation preserves all white space inside Templates.

## Creating/Editing a Camera Control Definition File

It is easier to start by copying an existing XML definition file designed for a particular camera, and then modify it as needed.

The following elements are important when creating a camera control definition file:

- Display Name
- Serial Port Configuration
- Data Rates
- Capabilities
- Parameters.

Each element, except display name, is discussed in the following sections.

## Configuring the Serial Port

Set the serial port configuration parameters to match exactly what the camera supports. On startup, the camera will start a configuration sequence. When the sequence is completed, the following information is displayed for PELCO P, D & Bosch Autodome:

- Camera name
- Version number
- Address
- Baud rate, DataBits and StopBits.

For BBV Star, only the Address and Baud rate information will display.

With this information you can set the serial port configuration using the <SerialPortConfiguration> element, as shown in the following example:

```
<SerialPortConfiguration>
    <Baud>9600</Baud>
    <DataBits>8</DataBits>
    <StopBits>1</StopBits>
    <Parity>None</Parity>
</SerialPortConfiguration>
```

**Note:** In the MP3200 system, the data bits, stop bits, and parity parameters are already configured and cannot be changed.

- **<Baud>** specifies the baud rate (bits per second). This specifies how quickly to send each bit of data. It must be an integer in the range 50 to 450000. The rate used must match what your camera is configured to expect.
- **<DataBits>** specifies how many data bits are in each byte of data sent to the camera. This value must be 7 or 8. This must match what your camera is configured to expect.
- **<StopBits>** specifies how many stop bits to send at the end of each byte of data (this has nothing to do with any stop commands in the camera, just the end of each byte of data). This value must be 1 or 2. It must match what your camera is configured to expect.
- **<Parity>** specifies if and what type of parity bit to send with each byte. If set to 'none', no parity is sent. If set to 'odd' or 'even', either odd or even parity bit is sent with each byte. This value must match what your camera is configured to expect.

## Configuring Data Rates

For the MP3200 system, the following baud rates are applicable to the BBV Star, Bosch Autodome, and PELCO D and P protocols:

```
<BaudRates>
    <BaudRate Rate = "9600"/>
    <BaudRate Rate = "4800"/>
    <BaudRate Rate = "2400"/>
    <BaudRate Rate = "1200"/>
</BaudRates>
```

## Setting the Capabilities Element

The <Capabilities> element enables/disables camera control functions supported by the camera. It also determines which UI controls are made available to the users in the camera control overlay, where the user can select from a range of values, and the valid range.

For example:

```
<Capabilities>
    <Capability Name="CamerasPerPort" Max="4" />
    <Capability Name="Flip"  Supported="true" />
    <Capability Name="Focus"  Supported="true" />
    <Capability Name="Iris"  Supported="true" />
    <Capability Name="MonitorNumber"
Supported="false" />
    <Capability Name="Pan"  Supported="true" />
    <Capability Name="Patterns"  Supported="true"/>
    <Capability Name="Rail"  Supported="false" />
    <Capability Name="Speed"  Supported="true"/>
    <Capability Name="Tilt"  Supported="true" />
    <Capability Name="Zoom"  Supported="true" />
    <Capability Name="ConfigurationUI"
Supported="true" />
</Capabilities>
```

## Formatting Parameters

Some commands might require run-time parameters to be inserted, such as camera address or a checksum. The format of these items is specified in the <ParameterFormatting> element.

Each parameter can be formatted to an ASCII decimal or hexadecimal string of some length, or a binary or word.

Common parameters for Bosch Autodome are:

```
<ParameterFormatting>
    <Parameter Name="{check}"   Style="byte"
Width="7" Method="sum" />
    <Parameter Name="{camera}"   Style="7H7L"
Width="14" Base="-1" />
    <Parameter Name="{preset}"   Style="byte"
Width="7" />
</ParameterFormatting>
```

Common parameters for BBV Star, Pelco-D, and Pelco-P are:

```
<ParameterFormatting>
    <Parameter Name="{check}"   Style="byte"
Width="8" Method="xor" />
    <Parameter Name="{camera}"   Style="byte"
Width="8" Base="255" />
    <Parameter Name="{preset}"   Style="byte"
Width="8" />
    <Parameter Name="{pattern}"   Style="byte"
Width="8" Base="255" />
    <Parameter Name="{speed}"   Style="byte"
Width="8" />
    <Parameter Name="{PanSpeed}"   Style="byte"
Width="8" />
    <Parameter Name="{TiltSpeed}"   Style="byte"
Width="8" />
</ParameterFormatting>
```

Only commands with capabilities specified as supported should be defined within the <Command> element. Unused commands can be omitted, or you can set their templates to an empty string (or set the count to zero).

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# Appendix A: BBV Star Card Protocol

## Features

Table 1 identifies the camera control functions available in the BBV Star Card protocol.

**Note:** American Dynamics has operated with the BBV RS485 Star Card dome model.

**Table 1. BBV Star Card function commands**

| Function | Capability/Capacity |
|---|---|
| **Pan** | Variable Speed |
| **Tilt** | Variable Speed |
| **Zoom In** | Single Speed |
| **Zoom Out** | Single Speed |
| **Flip** | No Command Available |
| **Focus Near** | Single Speed |
| **Focus Far** | Single Speed |
| **Iris Open** | Single Speed |
| **Iris Close** | Single Speed |
| **Define Pattern Max. Permitted** | 1 Pattern |
| **Call Pattern** | 1 Pattern (see Note) |
| **Repeat Patterns** | 1 Call Run Pattern (see Note) |
| **Define Preset Max. Permitted** | 32 Presets |
| **Call Preset** | 32 Presets |
| **Note:** The Call Pattern function will repeat the Pattern and not run a single run of the Pattern. | |

Table 2 identifies the keyboard dome commands available in the BBV Star Card protocol.

**Table 2. BBV Star Card keyboard dome commands**

| Keyboard | Dome Menu Access Commands |
|---|---|
| **AD2089** | 1 → HOLD → FOCUS FAR |
| **ADCC1100** | Tab Key T2 → 95 → DOME MENU → FOCUS FAR |
| **ADCC300** | F → ⇧ AND ■ → FOCUS FAR |
| **ADTTE** | 1 → HOLD → FOCUS FAR |

## Format

The BBV Star Card command string uses 8 hexadecimal bytes; that is, each data byte is in hexadecimal format. For example, Hex 06 and 12 represents decimal numbers 06 and 22 respectively.

Table 3 outlines the BBV Star Card format.

**Table 3. BBV Star Card command string format**

| Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 |
|---|---|---|---|---|---|---|---|
| BBV STX | Camera Address | Com-mand 1 | Com-mand 2 | Data 1 | Data 2 | BBV ETX | Check-sum |

- Byte 1 (BBV STX) – is always 0xB0
- Byte 2 (Camera Address) - logical address of the camera being controlled (Address 1 is 01)
- Byte 3 & 4 (Command 1 & 2) – see Table 4
- Byte 5 (Data 1) – pan speed, range from 00 (stop) to 0x40 (maximum speed)
- Byte 6 (Data 2) – tilt speed, range from 00 (stop) to 0x3F (maximum speed)
- Byte 7 (BBV ETX) – is always 0xBF
- Byte 8 (Checksum) – sum of bytes (excluding the synchronization byte), then mod 100 (Decimal code: 256)

**Table 4. Calculate BBV star camera control hexadecimal values for Bytes 3 & 4**

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 |
|---|---|---|---|---|
| **Command 1** | Fixed to 0 | Reserved | Reserved | Reserved |
| **Command 2** | 0 | Zoom Wide | Zoom Tele | Tilt Down |
| | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Command 1** | Iris Close | Iris Open | Focus Near | Focus Far |
| **Command 2** | Tilt Up | Pan Left | Pan Right | Fixed to 0 |

## Examples

1. For performing a pan left at maximum speed:
   - Pan Left(Byte4) : 0 0 0 0 0 1 0 0 = x04.
   - Pan Speed(Byte5): 0 1 0 0 0 0 0 0 = x40.
   - Command string is B0 00 04 00 04 40 00 BF {check}
2. For performing a tilt up at medium speed:
   - Tilt Up(Byte4) : 0 0 0 0 1 0 0 0 = x08.
   - Tilt Speed(Byte6): 0 0 1 0 0 0 0 0 = x20.

- Command string is B0 00 04 00 08 00 20 BF {check}

Where "{check}" is the checksum of all the bytes before.

## Defining the Command String

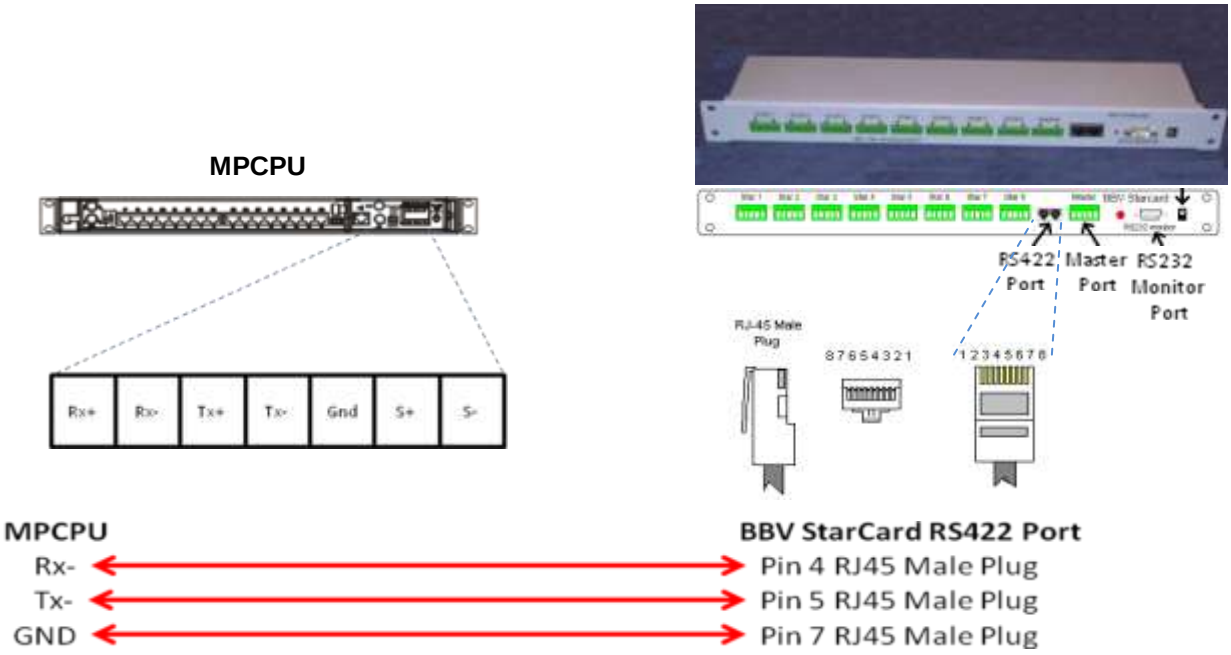
In each command definition, the template string is provided, which gets translated before being sent to the camera. In this handler, the command begins with the camera address, which is inserted using the {camera} parameter. Each command ends with a checksum byte using the {check} parameter. Extra blank lines are ignored.

See the following example:

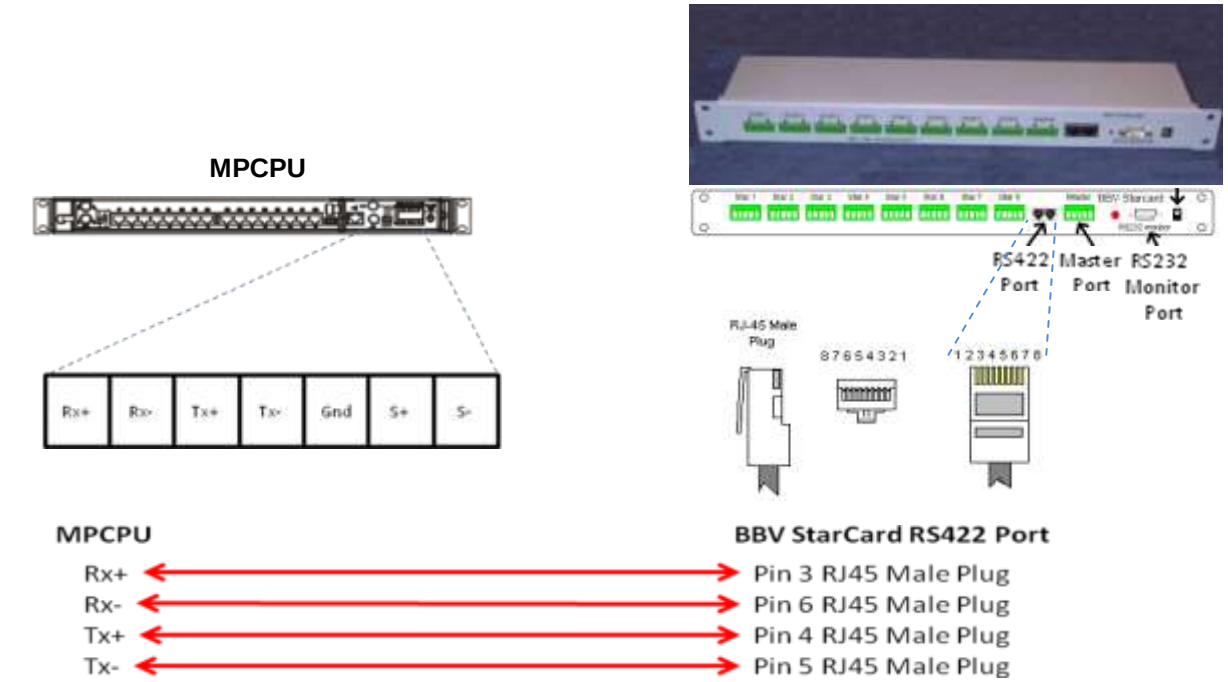
```
<Commands>
    <Command Name="FocusFarStart"          Template="\xB0{camera}\x02\x00\x20\x20\xBF{check}" />
    <Command Name="FocusFarStop"           Template="\xB0{camera}\x00\x00\x20\x20\xBF{check}" />
    <Command Name="FocusNearStart"         Template="\xB0{camera}\x01\x00\x20\x20\xBF{check}" />
    <Command Name="FocusNearStop"          Template="\xB0{camera}\x00\x00\x20\x20\xBF{check}" />
    <Command Name="IrisOpenStart"          Template="\xB0{camera}\x04\x00\x20\x20\xBF{check}" />
    <Command Name="IrisOpenStop"           Template="\xB0{camera}\x00\x00\x20\x20\xBF{check}" />
    <Command Name="IrisCloseStart"         Template="\xB0{camera}\x08\x00\x20\x20\xBF{check}" />
    <Command Name="IrisCloseStop"          Template="\xB0{camera}\x00\x00\x20\x20\xBF{check}" />
    <Command Name="PanLeftStart"           Template="\xB0{camera}\x00\x04\x20\x00\xBF{check}" />
    <Command Name="PanRightStart"          Template="\xB0{camera}\x00\x02\x20\x00\xBF{check}" />
    <Command Name="TiltDownStart"          Template="\xB0{camera}\x00\x10\x00\x20\xBF{check}" />
    <Command Name="TiltUpStart"            Template="\xB0{camera}\x00\x08\x00\x20\xBF{check}" />
    <Command Name="DiagUpLeftStart"        Template="\xB0{camera}\x00\x0C\x20\x20\xBF{check}" />
    <Command Name="DiagDownLeftStart"      Template="\xB0{camera}\x00\x14\x20\x20\xBF{check}" />
    <Command Name="DiagUpRightStart"       Template="\xB0{camera}\x00\x0A\x20\x20\xBF{check}" />
    <Command Name="DiagDownRightStart"     Template="\xB0{camera}\x00\x12\x20\x20\xBF{check}" />
    <Command Name="AllStop"                Template="\xB0{camera}\x00\x00\x20\x20\xBF{check}" />
    <Command Name="ZoomInStart"            Template="\xB0{camera}\x00\x20\x20\x20\xBF{check}" />
    <Command Name="ZoomInStop"             Template="\xB0{camera}\x00\x00\x20\x20\xBF{check}" />
    <Command Name="ZoomOutStart"           Template="\xB0{camera}\x00\x40\x20\x20\xBF{check}" />
    <Command Name="ZoomOutStop"            Template="\xB0{camera}\x00\x00\x20\x20\xBF{check}" />
    <Command Name="GotoPreset"             Template="\xB0{camera}\x00\x07\x00{preset}\xBF{check}" />
    <Command Name="DefinePreset"           Template="\xB0{camera}\x00\x03\x00{preset}\xBF{check}" />
    <Command Name="ConfigurationUI"        Template="\xB0{camera}\x00\x0f\x00\x00\xBF{check}" />
    <Command Name="DefinePattern"          Template="\xB0{camera}\x00\x03\x00\x5f\xBF{check}" />
    <Command Name="CancelPattern"          Template="\xB0{camera}\x00\x03\x00\x5f\xBF{check}" />
    <Command Name="EndPattern"             Template="\xB0{camera}\x00\x03\x00\x5f\xBF{check}" />
    <Command Name="RunPatternOnce"         Template="\xB0{camera}\x00\x07\x00\x63\xBF{check}" />
</Commands>
```

# BBV Star Card Wiring Diagrams

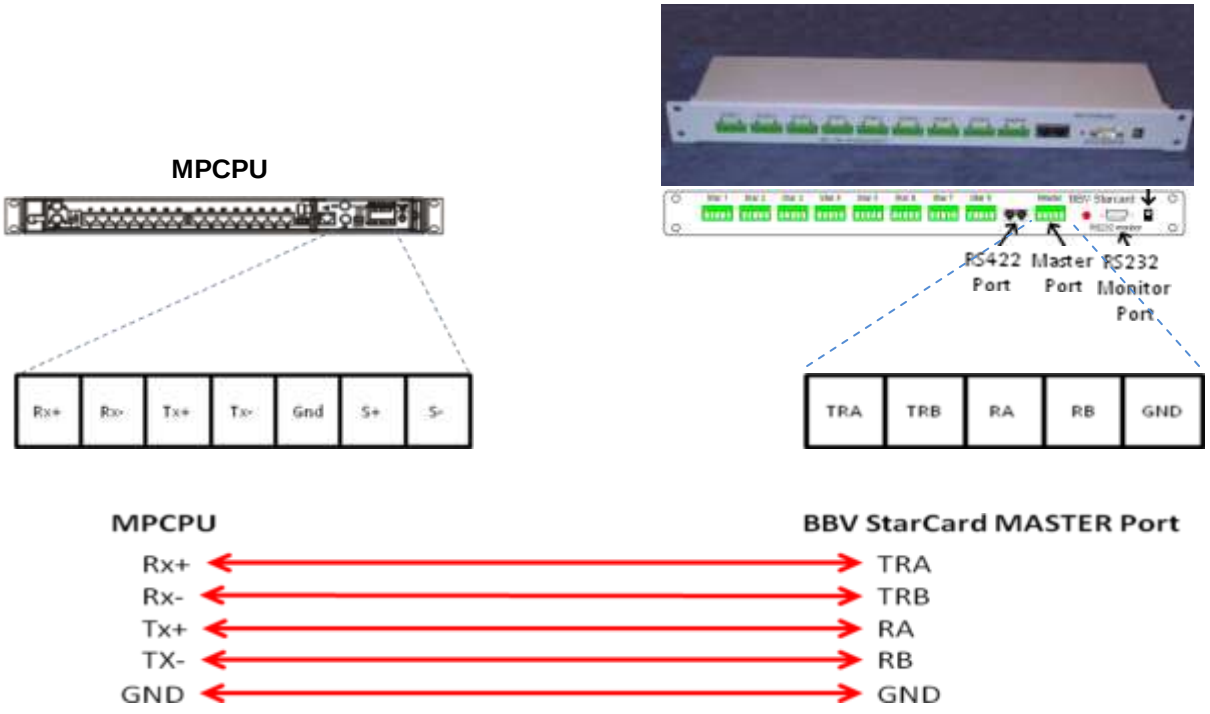
## RS-232 Port Connections




## RS-422 Port Connections



## RS-422 Master Port Connections



# Appendix B: Bosch Autodome Protocol

## Features

Table 5 identifies the camera control functions available in the Bosch Autodome protocol.

**Note:** American Dynamics has operated with the Bosch Autodome LTC 0945/15C dome model.

**Table 5. Bosch Autodome function commands**

| Function | Capability/Capacity |
|---|---|
| **Pan** | Single Speed |
| **Tilt** | Single Speed |
| **Zoom In** | Single Speed |
| **Zoom Out** | Single Speed |
| **Flip** | No Command |
| **Focus Near** | Single Speed |
| **Focus Far** | Single Speed |
| **Iris Open** | Single Speed |
| **Iris Close** | Single Speed |
| **Define Pattern Max. Permitted** | No Command |
| **Call Pattern** | No Command |
| **Repeat Patterns** | No Command |
| **Define Preset Max. Permitted** | 96 Presets |
| **Call Preset** | 96 Presets |

Table 6 identifies the keyboard dome commands available in the Bosch Autodome protocol.

**Table 6. Bosch Autodome keyboard dome commands**

| Keyboard | Dome Menu Access Commands |
|---|---|
| **AD2089** | No Command |
| **ADCC1100** | No Command |
| **ADCC300** | No Command |
| **ADTTE** | No Command |

## Format

The Bosch Autodome command string uses 8 hexadecimal bytes; that is, each data byte is in hexadecimal format. For example, Hex 06 and 12 represents decimal numbers 06 and 22 respectively.

Table 7 outlines the Bosch Autodome format.

**Table 7. Bosch Autodome command string format**

| Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 |
|---|---|---|---|---|---|---|---|
| Length | High/Low Camera Address | | Opcode | Data 1 | Data 2 | Data 3 | Check-sum |

- Byte 1 (Sync) – Specifies the number of bytes in the remainder of the packet
- Byte 2&3 (Cam Address's) – The Receiver/Driver High Order and Receive Driver Low
- Order Address Bytes
- Byte 4 (Opcode ) – see Table 8
- Byte 5 (Data 1) – see Table 8
- Byte 6 (Data 2) – see Table 8
- Byte 7 (Data 3) – see Table 8
- Byte 8 (Checksum) – computed as the sum of all previous bytes (including the length byte) in the message, mod 128 (logical AND sum with 7F hex)

**Table 8. Calculate Bosch Autodome camera control hexadecimal values for bytes 4 to 7**

| OPCODE | Data Byte | Bit | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 2 (Indefinite Activation) | 1 | 0 | 0 | 0 | Pan Left | Tilt Up | Zoom 0ut | Focus Near | Iris 0pen |
| | 2 | 0 | 0 | 0 | Pan Right | Tilt Down | Zoom In | Focus Far | Iris Close |
| 3 (PoorMan's Prepos) | 1 | 0 | Time (Value-1 – Number of half seconds | | | | | | Foc F |
| | 2 | 0 | Focus Near | Zoom In | Zoom 0ut | Tilt Up | Tilt Down | Pan Left | Pan Right |
| 4 (Pan/Tilt/ Zoom) | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | Focus Far |
| | 2 | 0 | Focus Near | Zoom In | Zoom 0ut | Tilt Up | Tilt Down | Pan Left | Pan Right |
| 5 (Indef Act Var Speed Pan/Tilt/Lens) | 1 | 0 | Zoom Speed | | | Tilt Speed | | | |
| | 2 | 0 | Pan Speed | | | | Iris O | Iris C | Foc F |
| | 3 | 0 | Focus Near | Zoom In | Zoom 0ut | Tilt Up | Tilt Down | Pan Left | Pan Right |
| 6 (Lens Control) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 0 | 0 | Iris 0pen | Iris Close | Focus Far | Focus Near | Zoom In | Zoom 0ut |
| 7 (Aux/ Prepos) | 1 | 0 | Numeric MSBs | | | Function Code (see Tables 5 and 6 ) | | | |
| | 2 | 0 | Numeric Data LSBs | | | | | | |
| 8 (Variable Speed Pan/Tilt/Lens) | 1 | 0 | Zoom Speed | | | Tilt Speed | | | |
| | 2 | 0 | Pan Speed | | | | Iris B | Iris D | Focus Far |
| | 3 | 0 | Focus Near | Zoom In | Zoom 0ut | Tilt Up | Tilt Down | Pan Left | Pan Right |

**Table 9. Bosch Autodome Pan Left command string hex values for bytes 4 to 6**

| Bit Contents | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Binary | Decimal | Hex |
| Length Byte | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 10000110 | 134 | 86 |
| High Order Address Byte | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 00000000 | 0 | 00 |
| Low Order Address Byte | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 00000000 | 0 | 00 |
| Opcode Byte | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 00000100 | 4 | 04 |
| Data Byte 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 00000000 | 0 | 00 |
| Data Byte 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 00000010 | 2 | 02 |
| Checksum Byte | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 00001100 | 12 | 0C |

**Table 10. Bosch Autodome diagonal (down-right) movement command string hex values for bytes 4 to 7**

| Bit Contents | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **Binary** | **Decimal** | **Hex** |
| Length Byte | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 10000111 | 135 | 87 |
| High Order Address Byte | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 00000000 | 0 | 00 |
| Low Order Address Byte | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 00111101 | 61 | 3D |
| Opcode Byte | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 00001000 | 8 | 08 |
| Data Byte 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 00001000 | 8 | 08 |
| Data Byte 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 00000010 | 2 | 02 |
| Data Byte 3 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 00000101 | 5 | 05 |
| Checksum Byte | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 00011001 | 25 | 19 |

## Defining the Command String

In each command definition, the template string is provided, which gets translated before being sent to the camera. In this handler, the command begins with the camera address, which is inserted using the {camera} parameter. Each command ends with a checksum byte using the {check} parameter. Extra blank lines are ignored.

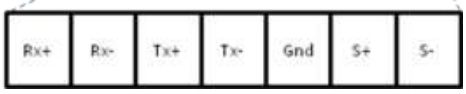
See the following example:

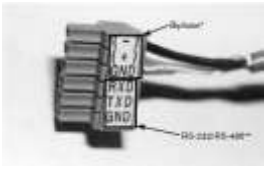
```
<Commands>
    <Command Name="FocusFarStart"          Template="\x86{camera}\x04\x01\x00{check}" Rate="20"/>
    <Command Name="FocusNearStart"         Template="\x86{camera}\x04\x00\x40{check}" Rate="20"/>
    <Command Name="IrisOpenStart"          Template="\x87{camera}\x08\x00\x04\x00{check}" Rate="20"/>
    <Command Name="IrisCloseStart"         Template="\x87{camera}\x08\x00\x02\x00{check}" Rate="20"/>
    <Command Name="PanLeftStart"           Template="\x87{camera}\x08\x00\x40\x02{check}" Rate="20"/>
    <Command Name="PanRightStart"          Template="\x87{camera}\x08\x00\x40\x01{check}" Rate="20"/>
    <Command Name="TiltDownStart"          Template="\x87{camera}\x08\x08\x00\x04{check}" Rate="20"/>
    <Command Name="TiltUpStart"            Template="\x87{camera}\x08\x08\x00\x08{check}" Rate="20"/>
    <Command Name="DiagUpLeftStart"        Template="\x87{camera}\x08\x08\x40\x0A{check}" Rate="20"/>
    <Command Name="DiagDownLeftStart"      Template="\x87{camera}\x08\x08\x40\x06{check}" Rate="20"/>
    <Command Name="DiagUpRightStart"       Template="\x87{camera}\x08\x08\x40\x09{check}" Rate="20"/>
    <Command Name="DiagDownRightStart"     Template="\x87{camera}\x08\x08\x40\x05{check}" Rate="20"/>
    <Command Name="ZoomInStart"            Template="\x86{camera}\x04\x00\x20{check}" Rate="20"/>
    <Command Name="ZoomOutStart"           Template="\x86{camera}\x04\x00\x10{check}" Rate="20"/>
    <Command Name="AllStop"                Template="\x86\x00{camera}\x02\x00\x00{check}" />
    <Command Name="GotoPreset"             Template="\x86{camera}\x07\x05{preset}{check}" />
    <Command Name="DefinePreset"           Template="\x86{camera}\x07\x04{preset}{check}" />
</Commands>
```

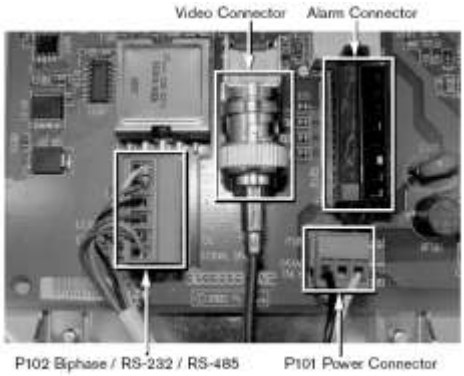
# Bosch AutoDome Wiring Diagram

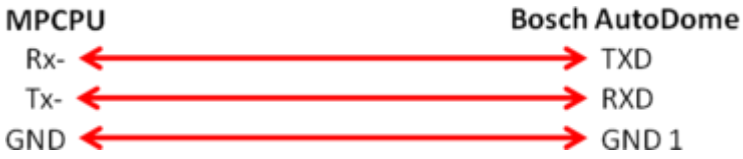
## LTC 0945/15C

**MPCPU**



# Appendix C: Pelco-D Protocol

## Features

Table 11 identifies the camera control functions available in the Pelco-D protocol.

**Table 11. Pelco-D function commands**

| Function | Capability/Capacity |
|---|---|
| **Pan** | Variable Speed |
| **Tilt** | Variable Speed |
| **Zoom In** | Single Speed |
| **Zoom Out** | Single Speed |
| **Flip** | 19-F1 (see Note 1) |
| **Focus Near** | Single Speed |
| **Focus Far** | Single Speed |
| **Iris Open** | Single Speed |
| **Iris Close** | Single Speed |
| **Define Pattern Max. Permitted** | 3 Patterns |
| **Call Pattern** | 3 Patterns (see Note 2) |
| **Repeat Patterns** | 3 Call Run Patterns (see Note 2) |
| **Define Preset Max. Permitted** | 42 Presets |
| **Call Preset** | 42 Presets |

**Notes:**

1) In addition to "19" followed by the "F1" key, the AD2089 joystick top and Control Center keyboard special keys also issue the Flip command.
2) The Call Pattern function will repeat the Pattern and not run a single run of the Pattern.

Table 12 identifies the keyboard dome commands available in the Bosch Pelco-D protocol.

**Table 12. Bosch Pelco-D keyboard dome commands**

| Keyboard | Dome Menu Access Commands |
|---|---|
| **AD2089** | 1 → HOLD → IRIS OPEN |
| **ADCC1100** | Tab Key T2 → 95 → PRESET soft key → FOCUS FAR |
| **ADCC300** | → 95 → IRIS OPEN |
| **ADTTE** | 1 → HOLD → IRIS OPEN |
| **Note:** Configuration UI also can be accessed by going into Keyboard programming mode and typing "95 Preset". | |

## Format

The Pelco-D command string uses 7 hexadecimal bytes; that is, each data byte is in hexadecimal format. For example, Hex 06 and 12 represents decimal numbers 06 and 22 respectively.

Table 13 outlines the Pelco-D format.

**Table 13. Pelco-D command string format**

| Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 |
|---|---|---|---|---|---|---|
| Sync | Camera Address | Command 1 | Command 2 | Data 1 | Data 2 | Check-sum |

- Byte 1 (Sync) – the synchronization byte, fixed to FF
- Byte 2 (Camera Address) - logical address of the camera being controlled (Address 1 is 01)
- Byte 3 and 4 (Command 1 and 2) – see Table 14
- Byte 5 (Data 1) – pan speed, range from 00 (stop) to high speed) and FF for “turbo” speed (the maximum pan speed that the device can go)
- Byte 6 (Data 2) – tilt speed, range from 00 (stop) to 3F (maximum speed)
- Byte 7 (Checksum) – sum of bytes (excluding the synchronization byte), then mod 100 (Decimal code: 256)

**Table 14. Calculate Pelco-D camera control hexadecimal bit values for Bytes 3 and 4**

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 |
|---|---|---|---|---|
| **Command 1** | Sense | Reserved | Reserved | Auto / Manual Scan |
| **Command 2** | Focus Far | Zoom Wide | Zoom Tele | Tilt Down |
| | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Command 1** | Camera On/Off | Iris Close | Iris Open | Focus Near |
| **Command 2** | Tilt Up | Pan Left | Pan Right | Fixed to 0 |

**Note:** American Dynamics has operated with the following dome models:

- Spectra II Model VDD5BC Ver. 3.31 with housing BB5A-PG-E
- Spectra III Model DD53CDW
- Spectra III Model DD53TC16
- Spectra IV SE Model DD4CBW35
- Spectra IV SE Model DD4C22 Ver. V1.072 with Back Box BB4-F

## Examples

1. You want a Pelco-D camera with Address 1 (00) to pan left at speed 0x47 (2F). The command template string of the first 6 bytes would be:

   Pan Left (Command 2): 0 0 0 0 0 1 0 0 = 04.
   Template string is FF 01 00 04 2F 00

2. Another example:

   Iris Open (Command 1): 0 0 0 0 0 0 1 0 = 02.
   Template string is FF 01 02 00 00 00

## Defining the Command String

In each command definition, the template string is provided, which gets translated before being sent to the camera. In this handler, the command begins with the camera address, which is inserted using the {camera} parameter. Each command ends with a checksum byte using the {check} parameter. Extra blank lines are ignored.

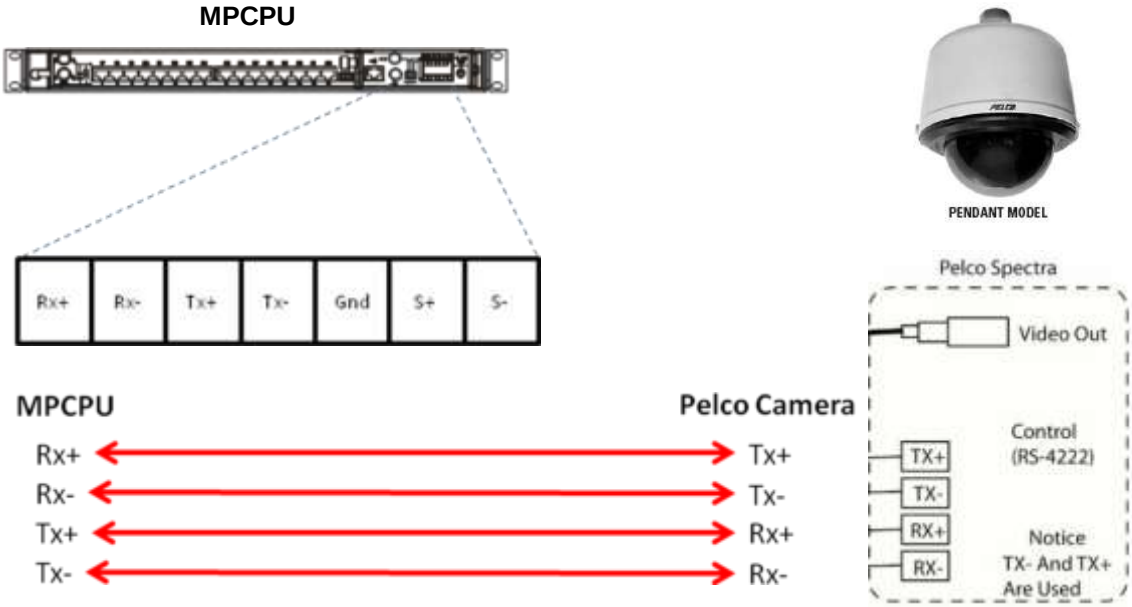
'Count' specifies a send count. The default is 1. The command string is sent the number of times specified. This is typically used to send stop commands more than once to ensure the string gets there. The code waits 100ms between sends. If set to 0 (zero), the string is never sent. This might be useful during debugging to disable a command temporarily without actually deleting it.

See the example on the next page.

```
<Commands>
    <Command Name="FocusFarStart"
    Template="\xFF{camera}\x00\x27\x00\x02\{check}\xFF{camera}\x00\x80\x00\x00{check}" />
    <Command Name="FocusFarStop"          Template="\xFF{camera}\x00\x00\x00\x00\{check}" Count="2"/>
    <Command Name="FocusNearStart"
    Template="\xFF{camera}\x00\x27\x00\x02\{check}\xFF{camera}\x01\x00\x00\x00{check}" />
    <Command Name="FocusNearStop"         Template="\xFF{camera}\x00\x00\x00\x00\{check}" Count="2"/>
    <Command Name="IrisAuto"              Template="\xFF{camera}\x06\x00\x00\x00\{check}" />
    <Command Name="IrisOpenStart"         Template="\xFF{camera}\x02\x00\x00\x00\{check}" />
    <Command Name="IrisOpenStop"          Template="\xFF{camera}\x00\x00\x00\x00\{check}" Count="2"/>
    <Command Name="IrisCloseStart"        Template="\xFF{camera}\x04\x00\x00\x00\{check}" />
    <Command Name="IrisCloseStop"         Template="\xFF{camera}\x00\x00\x00\x00\{check}" Count="2"/>
    <Command Name="PanLeftStart"          Template="\xFF{camera}\x00\x04\x30\x00\{check}" />
    <Command Name="PanLeftStop"           Template="\xFF{camera}\x00\x00\x00\x00\{check}" Count="2"/>
    <Command Name="PanRightStart"         Template="\xFF{camera}\x00\x02\x30\x00\{check}" />
    <Command Name="PanRightStop"          Template="\xFF{camera}\x00\x00\x00\x00\{check}" Count="2"/>
    <Command Name="TiltDownStart"         Template="\xFF{camera}\x00\x10\x00\x30\{check}" />
    <Command Name="TiltDownStop"          Template="\xFF{camera}\x00\x00\x00\x00\{check}" Count="2"/>
    <Command Name="TiltUpStart"           Template="\xFF{camera}\x00\x08\x00\x30\{check}" />
    <Command Name="TiltUpStop"            Template="\xFF{camera}\x00\x00\x00\x00\{check}" Count="2"/>
    <Command Name="DiagDownRightStart"    Template="\xFF{camera}\x00\x12\x30\x30\{check}" />
    <Command Name="DiagDownLeftStart"     Template="\xFF{camera}\x00\x14\ x30\x30\{check}" />
    <Command Name="DiagUpRightStart"      Template="\xFF{camera}\x00\x1A\ x30\x30\{check}" />
    <Command Name="DiagUpLeftStart"       Template="\xFF{camera}\x00\x1C\ x30\x30\{check}" />
    <Command Name="AllStop"               Template="\xFF{camera}\x00\x00\x00\x00\{check}" Count="2"/>
    <Command Name="ZoomInStart"
    Template="\xFF{camera}\x00\x25\x00\x02\{check}\xFF{camera}\x00\x20\x00\x00{check}" />
    <Command Name="ZoomInStop"            Template="\xFF{camera}\x00\x00\x00\x00\{check}" Count="2"/>
    <Command Name="ZoomOutStart"
    Template="\xFF{camera}\x00\x40\x00\x00\{check}\xFF{camera}\x00\x40\x00\x00{check}" />
    <Command Name="ZoomOutStop"           Template="\xFF{camera}\x00\x00\x00\x00\{check}" Count="2"/>
    <Command Name="GotoPreset"            Template="\xFF{camera}\x00\x07\x00{preset}\{check}" />
    <Command Name="DefinePreset"          Template="\xFF{camera}\x00\x03\x00{preset}\{check}" />
    <Command Name="DefinePattern"         Template="\xFF{camera}\x00\x1F\x00{pattern}{check}" />
    <Command Name="EndPattern"            Template="\xFF{camera}\x00\x21\x00{pattern}{check}" />
    <Command Name="RunPatternOnce"        Template="\xFF{camera}\x00\x23\x00{pattern}\{check}" />
    <Command Name="Flip"                  Template="\xFF{camera}\x00\x07\x00\x21\{check}" />
</Commands>
```

# Pelco-D Wiring Diagram

## Spectra II Model VDD5BC Ver. 3.31 with housing BB5A PG E
## Spectra III Model DD53CDW
## Spectra III Model DD53TC16
## Spectra IV SE Model DD4CBW35
## Spectra IV SE Model DD4C22 Ver. V1.072 with Back Box BB4-F




**Note:** The Pelco-D protocol only uses one-way (simplex) communications. The MPCPU data return lines (Rx+ and Rx-) are not used.

# Appendix D: Pelco-P Protocol

## Features

Table 15 identifies the camera control functions available in the Pelco-P protocol.

**Table 15. Pelco-P function commands**

| Function | Capability/Capacity |
|---|---|
| **Pan** | Variable Speed |
| **Tilt** | Variable Speed |
| **Zoom In** | Single Speed |
| **Zoom Out** | Single Speed |
| **Flip** | 19-F1 (see Note 1) |
| **Focus Near** | Single Speed |
| **Focus Far** | Single Speed |
| **Iris Open** | Single Speed |
| **Iris Close** | Single Speed |
| **Define Pattern Max. Permitted** | 3 Patterns |
| **Call Pattern** | 3 Patterns (see Note 2) |
| **Repeat Patterns** | 3 Call Run Patterns (see Note 2) |
| **Define Preset Max. Permitted** | 42 Presets |
| **Call Preset** | 42 Presets |
| **Notes:**<br>1) In addition to "19" followed by the "F1" key, the AD2089 joystick top and Control Center keyboard special keys also issue the Flip command.<br>2) The Call Pattern function will repeat the Pattern and not run a single run of the Pattern. | |

Table 16 identifies the keyboard dome commands available in the Pelco-P protocol.

**Table 16. Bosch Pelco-P keyboard dome commands**

| Keyboard | Dome Menu Access Commands |
|---|---|
| **AD2089** | 1 → HOLD → IRIS OPEN |
| **ADCC1100** | Tab Key T2 → 95 → PRESET soft key → FOCUS FAR |
| **ADCC300** | F → 95 → IRIS OPEN |
| **ADTTE** | 1 → HOLD → IRIS OPEN |
| **Note:** Configuration UI also can be accessed by going into Keyboard programming mode and typing "95 Preset". | |

## Format

The Pelco-P command string uses 8 hexadecimal bytes; that is, each data byte is in hexadecimal format. For example, Hex 06 and 12 represents decimal numbers 06 and 22 respectively.

Table 17 outlines the Pelco-P format.

**Table 17. Pelco-P command string format**

| Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 |
|---|---|---|---|---|---|---|---|
| STX | Camera Address | Data 1 | Data 2 | Data 3 | Data 4 | ETX | Check -sum |

- Byte 1 (STX) - Start of Text, fixed to A0
- Byte 2 (Camera Address) - logical address of the camera being controlled (Address 1 is 00)
- Byte 3 to 6 (Data 1 to 4) – see Table 18
- Byte 7 (ETX) - End of Text, fixed to AF
- Byte 8 (Checksum) - xOR sum of Bytes 1 to 7

**Table 18. Calculate Pelco-P camera control hexadecimal bit values for Bytes 3 to 6**

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 |
|---|---|---|---|---|
| **Data 1** | Fixed to 0 | Camera On | Auto Scan On | Camera On/Off |
| **Data 2** | Fixed to 0 | Zoom Wide | Zoom Tele | Tilt Down |
| **Data 3** | Pan speed 00 (stop) to 3F (high speed)and 40 for Turbo | | | |
| **Data 4** | Tilt speed 00 (stop) to 3F (high speed) | | | |
| | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Data 1** | Iris Close | Iris Open | Focus Near | Focus Far |
| **Data 2** | Tilt Up | Pan Left | Pan Right | 0 (for Pan/Tilt) |
| **Data 3** | Pan speed 00 (stop) to 3F (high speed) and 40 for Turbo | | | |
| **Data 4** | Tilt speed 00 (stop) to 3F (high speed) | | | |

**Note:** American Dynamics has operated with the following dome models:

- Spectra II Model VDD5BC Ver. 3.31 with housing BB5A-PG-E
- Spectra III Model DD53CDW
- Spectra III Model DD53TC16
- Spectra IV SE Model DD4CBW35

- Spectra IV SE Model DD4C22 Ver. V1.072 with Back Box BB4-F

## Examples

1. You want a Pelco-D camera with Address 1 (00) to pan left at speed 0x47 (2F). The command template string of the first 6 bytes would be:

   Pan Left (Command 2): 0 0 0 0 0 1 0 0 = 04. Template string is FF 01 00 04 2F 00

2. Another example:

   Iris Open (Command 1): 0 0 0 0 0 0 1 0 = 02. Template string is FF 01 02 00 00 00

## Defining the command string

In each command definition, the template string is provided, which gets translated before being sent to the camera. In this handler, the command begins with the camera address, which is inserted using the {camera} parameter. Each command ends with a checksum byte using the {check} parameter. Extra blank lines are ignored.

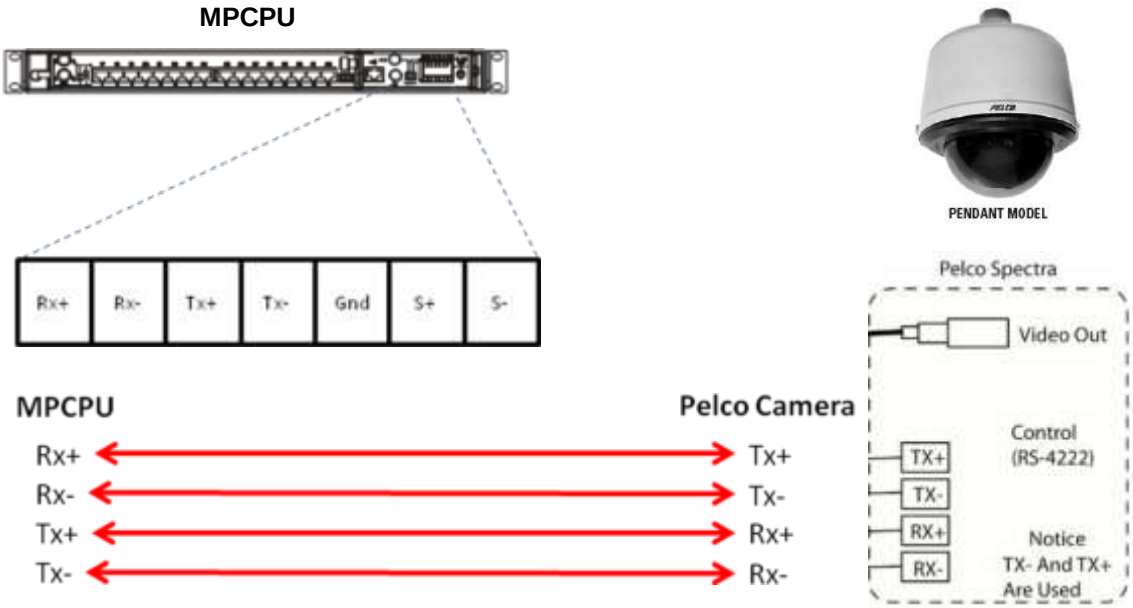
'Count' specifies a send count. The default is 1. The command string is sent the number of times specified. This is typically used to send stop commands more than once to ensure the string gets there. The code waits 100ms between sends. If set to 0 (zero), the string is never sent. This might be useful during debugging to disable a command temporarily without actually deleting it.

See the example on the next page.

```
<Commands>
    <Command Name="FocusFarStart"          Template="\xA0{camera}\x01\x00\x00\x00\xAF{check}" />
    <Command Name="FocusFarStop"           Template="\xA0{camera}\x00\x00\x00\x00\xAF{check}" Count="2"/>
    <Command Name="FocusNearStart"         Template="\xA0{camera}\x02\x00\x00\x00\xAF{check}" />
    <Command Name="FocusNearStop"          Template="\xA0{camera}\x00\x00\x00\x00\xAF{check}" Count="2"/>
    <Command Name="IrisAuto"               Template="\xA0{camera}\x06\x00\x00\x00\xAF{check}" />
    <Command Name="IrisOpenStart"          Template="\xA0{camera}\x04\x00\x00\x00\xAF{check}" />
    <Command Name="IrisOpenStop"           Template="\xA0{camera}\x00\x00\x00\x00\xAF{check}" Count="2"/>
    <Command Name="IrisCloseStart"         Template="\xA0{camera}\x08\x00\x00\x00\xAF{check}" />
    <Command Name="IrisCloseStop"          Template="\xA0{camera}\x00\x00\x00\x00\xAF{check}" Count="2"/>
    <Command Name="PanLeftStart"           Template="\xA0{camera}\x00\x04\x2F\x00\xAF{check}" />
    <Command Name="PanLeftStop"            Template="\xA0{camera}\x00\x00\x00\x00\xAF{check}" Count="2"/>
    <Command Name="PanRightStart"          Template="\xA0{camera}\x00\x02\x2F\x00\xAF{check}" />
    <Command Name="PanRightStop"           Template="\xA0{camera}\x00\x00\x00\x00\xAF{check}" Count="2"/>
    <Command Name="TiltDownStart"          Template="\xA0{camera}\x00\x10\x00\x2F\xAF{check}" />
    <Command Name="TiltDownStop"           Template="\xA0{camera}\x00\x00\x00\x00\xAF{check}" Count="2"/>
    <Command Name="TiltUpStart"            Template="\xA0{camera}\x00\x08\x00\x2F\xAF{check}" />
    <Command Name="TiltUpStop"             Template="\xA0{camera}\x00\x00\x00\x00\xAF{check}" Count="2"/>
    <Command Name="DiagDownRightStart"     Template="\xA0{camera}\x00\x12\x2F\x2F\xAF{check}" />
    <Command Name="DiagDownLeftStart"      Template="\xA0{camera}\x00\x14\x2F\x2F\xAF{check}" />
    <Command Name="DiagUpRightStart"       Template="\xA0{camera}\x00\x1A\x2F\x2F\xAF{check}" />
    <Command Name="DiagUpLeftStart"        Template="\xA0{camera}\x00\x1C\x2F\x2F\xAF{check}" />
    <Command Name="AllStop"                Template="\xA0{camera}\x00\x00\x00\x00\xAF{check}" Count="2"/>
    <Command Name="ZoomInStart"            Template="\xA0{camera}\x00\x20\x00\x00\xAF{check}" />
    <Command Name="ZoomInStop"             Template="\xA0{camera}\x00\x00\x00\x00\xAF{check}" Count="2"/>
    <Command Name="ZoomOutStart"           Template="\xA0{camera}\x00\x40\x00\x00\xAF{check}" />
    <Command Name="ZoomOutStop"            Template="\xA0{camera}\x00\x00\x00\x00\xAF{check}" Count="2"/>
    <Command Name="GotoPreset"             Template="\xA0{camera}\x00\x07\x00{preset}\xAF{check}" />
    <Command Name="DefinePreset"           Template="\xA0{camera}\x00\x03\x00{preset}\xAF{check}" />
    <Command Name="DefinePattern"          Template="\xA0{camera}\x00\x1F\x00\x00\xAF{check}" />
    <Command Name="EndPattern"             Template="\xA0{camera}\x00\x21\x00\x00\xAF{check}" />
    <Command Name="RunPatternOnce"         Template="\xA0{camera}\x00\x23\x00{pattern}\xAF{check}" />
    <Command Name="Flip"                   Template="\xA0{camera}\x00\x07\x00\x21\xAF{check}" />
    <!--<Command Name="ConfigurationUI"    Template="\xA0{camera}\x00\x07\x00\x95\xAF{check}" />-->
</Commands>
```

# Pelco-P Wiring Diagram

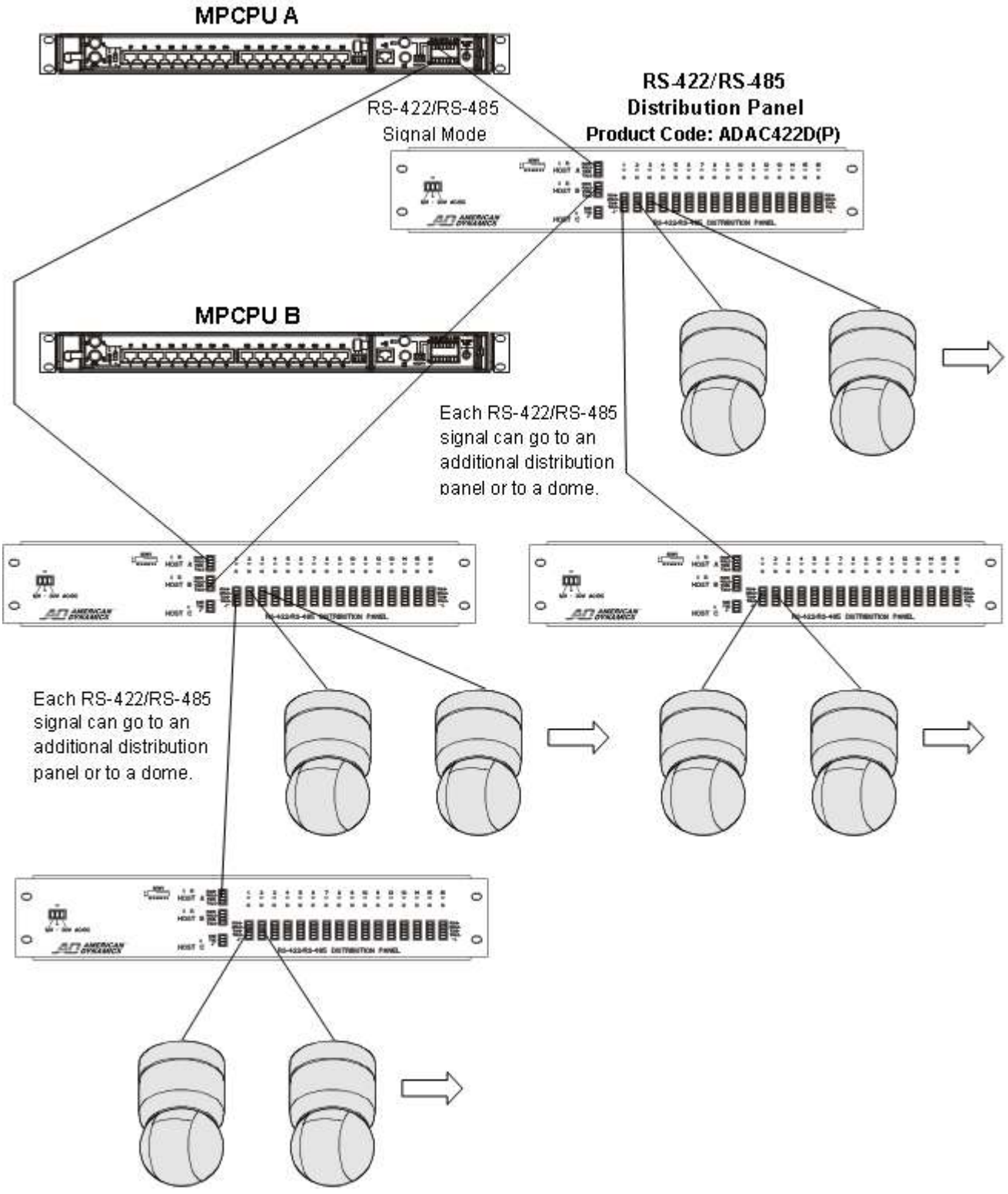
## Spectra II Model VDD5BC Ver. 3.31 with housing BB5A PG E
## Spectra III Model DD53CDW
## Spectra III Model DD53TC16
## Spectra IV SE Model DD4CBW35
## Spectra IV SE Model DD4C22 Ver. V1.072 with Back Box BB4-F



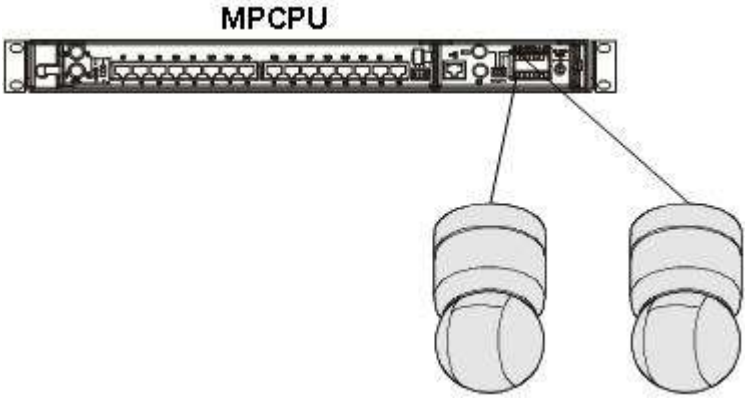

**Note:** The Pelco-P protocol only uses one-way (simplex) communications. The MPCPU data return lines (Rx+ and Rx-) are not used.

# Appendix E: Block Diagrams

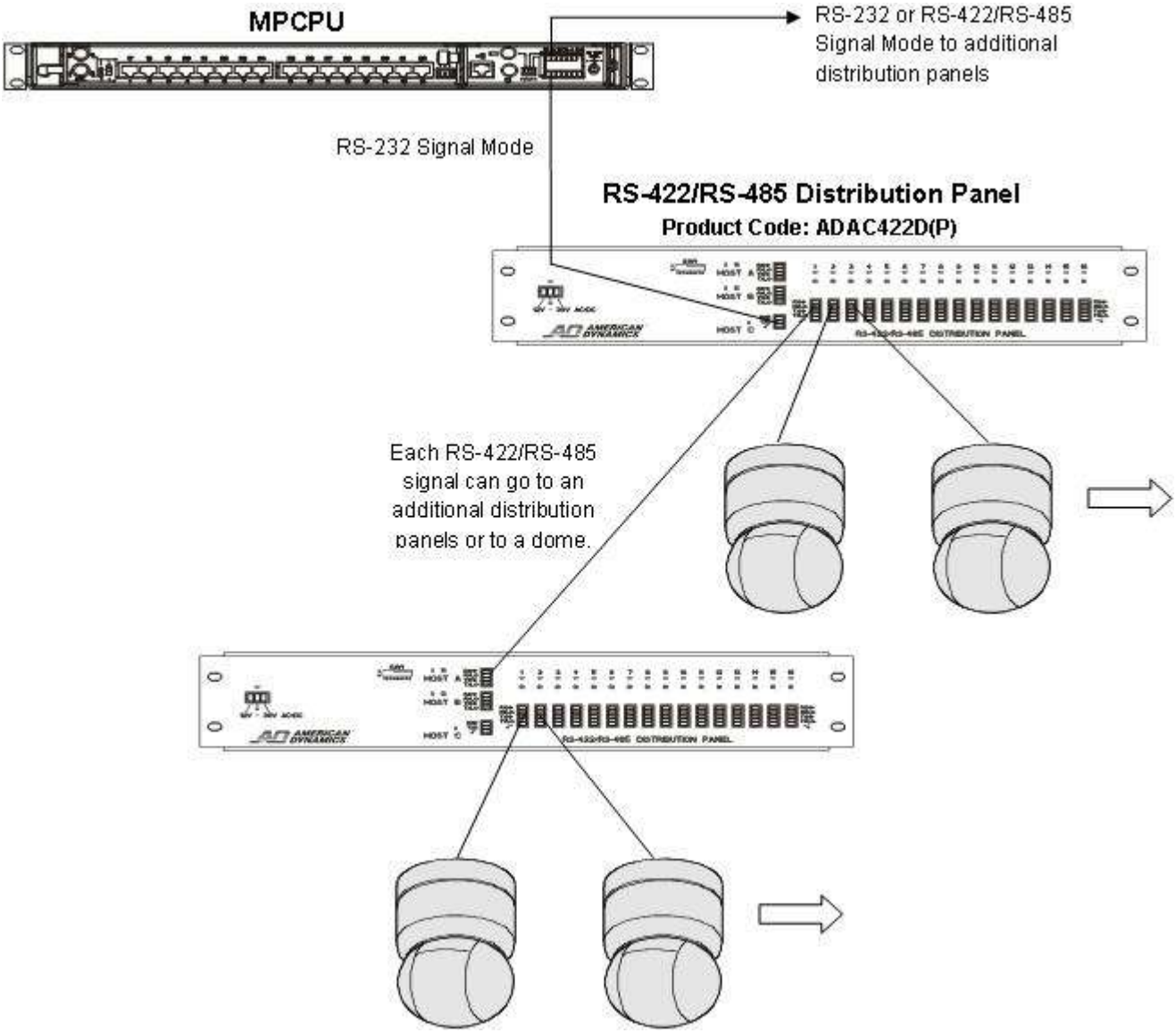
## Dual MPCPU system with RS-422/RS-485 direct connection dome/PTZ devices using RS-422/RS-485 Distribution Panel, ADAC422D(P)


MPCPU A
RS-422/RS-485
Signal Mode
RS-422/RS-485
Distribution Panel
Product Code: ADAC422D(P)
MPCPU B
Each RS-422/RS-485 signal can go to an additional distribution panel or to a dome.
Each RS-422/RS-485 signal can go to an additional distribution panel or to a dome.

## Single MPCPU system with one dome/PTZ on each of the two connections




## Single MPCPU using RS-232 mode to connect to the first RS-422/RS-485 Distribution Panel, ADAC422D(P)


MPCPU
RS-232 or RS-422/RS-485 Signal Mode to additional distribution panels
RS-232 Signal Mode
RS-422/RS-485 Distribution Panel
Product Code: ADAC422D(P)
Each RS-422/RS-485 signal can go to an additional distribution panels or to a dome.

# Appendix F: Creating Templates

Templates can contain the following:

- Most ASCII characters
- Binary bytes encoded, such as '\xFF', where FF is two hex digits (0-9,A-F) representing the value
- Parameter placeholders, such as {check}. Always enclosed in curly brackets.

If you need to include any of these special characters in a template, you should use the binary byte encoding format to specify their actual binary value (elsewhere in XML may require other encoding).

You can also include the characters shown in Table 19 using the XML syntax, such as "&", but non-printing characters will be difficult to read in the debug window.

**Table 19. Special XML characters**

| Character | Name | Hex |
|---|---|---|
| & | ampersand | \x26 |
| \ | backslash | \x5C |
| < | open angle | \x3C |
| > | close angle | \x3E |
| { | open curly | \x7B |
| } | close curly | \x7D |
| ' | apostrophe | \x27 |
| " | quote | \x22 |

To keep track of other details relating to a particular camera handler, additional items can be included within the following elements:

- <CameraInfo>
- <Author>
- <Date>
- <Notes>

Templates can not contain:

- Anything that XML considers special, such as the ampersand (&), angle brackets (<>), and single (') or double quotes (")
- Anything that the template translator considers special, such as \ { } (backslash, curly brackets).

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